Patent Claims:

1. A vertically integrated component
   - having a first electrically conductive layer;
   - having a middle layer, formed partially from dielectric material, on the first electrically conductive layer;
   - having a second electrically conductive layer on the middle layer;
   - having a nanostructure which is integrated in a via hole introduced into the middle layer and comprises a first end portion that is coupled to the first electrically conductive layer and a second end portion that is coupled to the second electrically conductive layer;
   - the middle layer, between two adjacent dielectric sublayers, having a third electrically conductive layer, the thickness of which is less than the thickness of at least one of the dielectric sublayers.

2. The component as claimed in claim 1, in which catalyst material for catalyzing the formation of the nanostructure is arranged between the first conductive layer and the nanostructure.

3. The component as claimed in claim 1 or 2, in which the third electrically conductive layer surrounds the nanostructure in a region around the first or second end portion.

4. The component as claimed in one of claims 1 to 3, in which the thickness of the third electrically conductive layer is less than the thickness of both dielectric sublayers.

5. Component according to one of claims 1 to 4, designed as a field-effect transistor, in which

- the first end portion of the nanostructure forms a first source/drain region and the second end portion of the nanostructure forms a second source/drain region;
- a ring structure formed from an electrically insulating material as gate-insulating region of the field-effect transistor is arranged in the third electrically conductive layer, which forms the gate electrode of the field-effect transistor, along the via hole that has been introduced therein.

6. The component as claimed in claim 5, in which the middle layer has an additional electrically conductive layer, which at least one additional electrically conductive layer serves as an additional gate electrode of the field-effect transistor, with an additional ring structure formed from an electrically insulating material as an additional gate-insulating region of the field-effect transistor being arranged along the via hole that has been introduced in the additional electrically conductive layer.

7. The component as claimed in claim 5 or 6, having an additional field-effect transistor above the field-effect transistor.

8. The component as claimed in claim 7, in which the field-effect transistor and the additional field-effect transistor are connected to one another as an inverter circuit.

9. The component as claimed in one of claims 1 to 8, in which the first and/or second electrically conductive layer includes

- tantalum
- tantalum nitride
- titanium
- molybdenum
- aluminum
- titanium nitride and/or
- a ferromagnetic material; or
- a layer stack comprising these materials.

10. The component as claimed in one of claims 6 to 9, in which the third and/or additional electrically conductive layer includes
- polysilicon;
- tantalum;
- titanium;
- niobium and/or
- aluminum.

11. The component as claimed in one of claims 1 to 10, in which the dielectric material of the middle layer is one or a combination of the materials
- silicon dioxide
- silicon nitride, or
- silicon dioxide doped with potassium ions.

12. The component as claimed in one of claims 1 to 11, in which the nanostructure includes
- a nanotube
- a bundle of nanotubes, or
- a nanorod.

13. The component as claimed in claim 12, in which the nanorod includes
- silicon
- germanium
- indium phosphide
- gallium nitride
- gallium arsenide

- zirconium oxide and/or
- a metal.

14. The component as claimed in claim 12, in which the nanotube is
    - a carbon nanotube
    - a carbon-boron nanotube
    - a carbon-nitrogen nanotube
    - a tungsten sulfide nanotube, or
    - a chalcogenide nanotube.

15. The component as claimed in one of claims 2 to 14, in which the nanostructure is a carbon nanotube, and in which the catalyst material includes
    - iron
    - cobalt and/or
    - nickel.

16. The component as claimed in one of claims 2 to 14, in which the nanostructure is a gallium arsenide nanorod, and in which the catalyst material includes gold.

17. The component as claimed in one of claims 1 to 16, in which the subregion of the via hole which does not have the nanostructure in it is at least partially filled by an electrically insulating spacer structure.

18. The component as claimed in one of claims 1 to 17, which is formed exclusively from dielectric material, metallic material and the material of the nanostructure.

19. The component as claimed in one of claims 1 to 18, which is formed on and/or in a substrate made from polycrystalline or amorphous material.

20. A component array, comprising at least two components as claimed in one of claims 1 to 19 arranged next to one another and/or at least two components as claimed in one of claims 1 to 19 arranged above one another.

21. A method for fabricating a vertically integrated component, in which

- a first electrically conductive layer is formed;
- a middle layer is formed partially from dielectric material;
- a via hole is introduced into the middle layer;
- a nanostructure having a first end portion and a second end portion is formed in the via hole, the first end portion being coupled to the first electrically conductive layer;
- a second electrically conductive layer is formed on the middle layer and is coupled to the second end portion of the nanostructure;
- the middle layer is formed in such a manner that a third electrically conductive layer is formed between two adjacent dielectric sublayers, the thickness of which third electrically conductive layer is less than the thickness of at least one of the dielectric sublayers.